ZERO ENERGY BUILDING
Conversion Retrofitting of Existing Building in Malaysia

ASTAKA SPORT COMPLEX

Majlis Bandaraya Petaling Jaya

National & ASEAN Energy Award

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Majlis Bandaraya Petaling Jaya (MBPJ)

JOURNEY IMPLEMENTING SUSTAINABLE ENERGY

Efficiency Energy Program

2016 — Starting with Headquarters facilitated by SIRIM

2017 — Team energy efficiency committee officially established

2018 — Perform energy efficiency audit work on the MBPJ building facilitated by SEDA Malaysia

2019 — In cooperation with the UK Carbon Trust, Petaling Jaya City Council (MBPJ) has developed a draft of the carbon management plan 2015-2020

2020 — (2020 – 2023) Collaboration with SEDA Malaysia under Energy Efficiency (EE) Management and Renewable Energy Program

Low Carbon City Action Plan 2015-2030

2021 — Participated in National Energy Award (NEA) for Menara MBPJ

Strategic Plan for Petaling Jaya Smart, Sustainable & Resilient 2030

2022 — Mbpj Astaka building has won the national energy award for the Energy-Efficient Building Zero Energy Building category

2023 — Continue collaboration with SEDA Malaysia (2023 – 2026)

OUR GOAL : **2030** LOW CARBON CITY

Low Carbon Strategic Plan

BACKGROUND

ASTAKA Sport Complex Overview

- **Owned by Petaling Jaya City Council (MBPJ). The ASTAKA was built 42 years ago**
- **Has 8 squash courts, administration office, prayer rooms, foyer, meeting room, and tennis court.**
- Operates frequently, especially at night due to increased sport health activities.
- Energy management activities limited due to conventional lighting and non-efficient air-conditioning.
- **MBPJ retrofitted extensively in 2017 and 2018.**
- **Retrofitting increased comfort, safety, lighting, cooling, and electricity efficiency.**
- Energy use dropped considerably in 2017 and 2021.

INTRODUCTION

Case of Retrofitting of Existing Building

THE ASTAKA BUILDING

- Simple and straight forward retrofitting
- According to ZEB Ready target performance
- Step by Step approach affordable
- Reduced energy up to **64.8 % on Energy Efficiency**
- **Sustainable Energy GreenPASS (ZEB Ready) 2019**
- **National Energy Award** (ZEB Ready) **2022**
- **ASEAN Energy Award** (ZEB Ready) **2022**

The objective of retrofitting project

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To Building Operation

- **To reduce operation cost / overhead** by reducing electricity bill. Public facilities and services used by the community are charged at lower rates. Thus**, to reduce the overhead burden, the building must operate at minimum cost.**

For The Community

- To enjoy more **conducive, comfortable, safety and good facilities services at affordable rates.**
- Indirectly, the use of better technology (efficient products) will **promote and enhance the awareness of energy savings.**

To MBPJ

- **Reduce** utility / energy cost.
- **Capacity building / new experience to MBPJ** on energy savings and reduce carbon emission.
- Pilot demonstration of the **1st high performance energy efficiency retrofitting** at MBPJ's assets. This **creates example and motivation to MBPJ's staffs**. After the success, MBPJ had **embarked the Energy Management Program in 2021** and several MBPJ's building has undergo energy auditing and, in the progress, to implement phase by phase retrofitting.
- To demonstrate **as pioneer among the PBTs, government to lead by-example** in managing and reducing energy and carbon.

To Government & Industry

- Shows that **simple, straight forward / practical but affordable zero energy building (ZEB) for existing building is achievable**. No need to construct new ZEB buildings.
- Same concept **can be applied** to private and government buildings.
- Direct support the national **45% carbon intensity** reduction target by 2030 and **carbon neural target by 2050.**

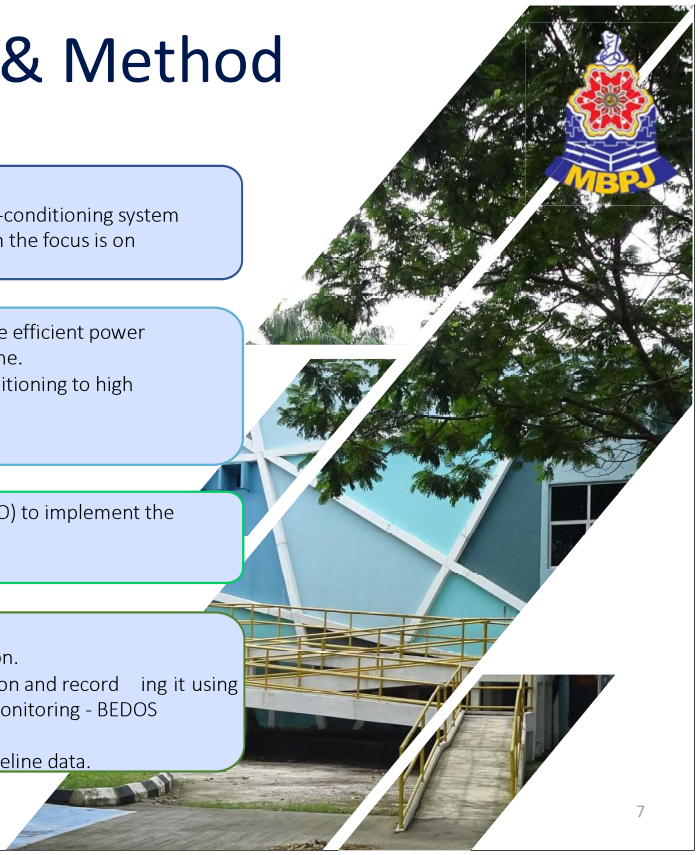
THE ASTAKA BUILDING

Name of Building	**Astaka Sport Complex (Kompleks Sukan Astaka)**
Owner	Majlis Bandaraya Petaling Jaya (MBPJ)
Address	Jalan Utara, Seksyen 52, 46200 Petaling Jaya, Selangor
Type of Building	**Multipurpose Building (Sport Complex) (Tariff B)**
Age of Building	**Operated since 1982 (42 Years)**
Gross Floor Area (GFA)	4,625.08 sq.m
Net Floor Area (NFA)	2,060.69 sq.m
Building Energy Consumption of Baseline Year (2015)	**106,218 kWh/yr**
Building Energy Consumption of Reporting Year (2019)	**37,366.00 kWh/yr**
Nature of Business	A building complex of sport facilities include football field, rugby field, tennis court, squash courts and common areas
ZEB Category	ZEB Ready **(64.82% Energy Saving excluding Renewable Energy)**

Energy Savings Approach & Method

ASTAKA BUILDING

Identify the main energy consumer / activities or process	• Quick **energy audit with energy consumption data**. • Analyse and obviously found that lighting and air -conditioning system uses about 81% from the total energy . That is mean the focus is on Lighting and air- conditioning system.
Identify the potential Energy Saving Measures (ESMs)	• Propose to change the inefficient lighting system. The efficient power rated is lower about 50% compared to the current one. • Propose to change the old and inefficient air -conditioning to high efficiency one. • Choose possibly the most viable cost.
Implement Retrofitting	• Appoint contractor or Energy Service Company (ESCO) to implement the retrofitting. • Testing and Commissioning
Implement energy management and fine-tuning during operation	• Operate the building according to the function. • Keep finetuning in order to get the best configuration. • Monitor and collect ing monthly energy consumption and record ing it using cloud-based system (Building Energy Online Data Monitoring - BEDOS www.sed a.gov.my/bedos • Analyse and compare the performance with the baseline data.



Summary of retrofitting work in Astaka

1.0 Improvement of Passive Design	
Installation of metal cladding at some part of the building to provides shades and reduce direct heat from the sun	
2.0 Improvement of Active Design	
• Replacement of conventional Metal Halide spotlight (400W/lamp) & florescent light (40W/ lamp) to high-efficient light (20 Watt/ lamp) & (18 Watt/lamp). • Replacement of old air-conditioning system (ACSU) with 5-Star Rating air condition. • Replacement of old air-conditioning system (ACPU Type) to high-efficient system.	
3.0 Other sustainable feature	
Installation of Rainwater Harvesting System	

Building Energy Performance/Savings

Building Energy Performance/Savings

Item	Energy Saving Measures	Retrofitting / Improvement Taken	Estimated Savings	Overall Savings Based on Total Energy.
1	Retrofitting the internal lighting system.	Replacement of conventional florescent light (40W) to high-efficient light LED (20W and 18W). - Saving is based on power reduction.	60%	**106,218 kWh/year** **Baseline (2015)** **37,366 kWh/year** **Reporting Year (2019)** **68,852 kWh/year** **The Total Reduction** = Baseline – Reporting Yr = 106,218 - 37,366.00 40 Tco_2 Carbon Reduction *Note: Based on emission factor of 0.585 tCO2/MWh (Peninsular Malaysia) - 2017 CDM Electricity Baseline for Malaysia **Percentage savings** **64.8% reduction** (qualify for ZEB READY)
2	Retrofitting of the air-conditioning system.	Upgrading to high-efficiency electrical appliances only (ACPU), Outdated equipment (1 unit) & Upgrading to high-efficiency electrical appliances only (ACSU), ACS Unit with a 5-star rating (6 units) - Saving is based on COP improvement	30%	
3	Improvement of the passive system	Building painting, building shading (new cladding), improve building wall and floor. - Saving is based on lower heat penetration into the building and reduced cooling load., light colour painting promotes good daylight and use less artificial lighting during the day.	Unable to calculate the savings.	
4	Energy management	Energy management practice and finetuning in operation. - Saving is based on integrated action by awareness, energy monitoring and action, finetuning. - This also help to reduce further energy from lighting and air-conditioning system.	Unable to calculate the savings due to lack of collected data.	

ZEB Realization Plan

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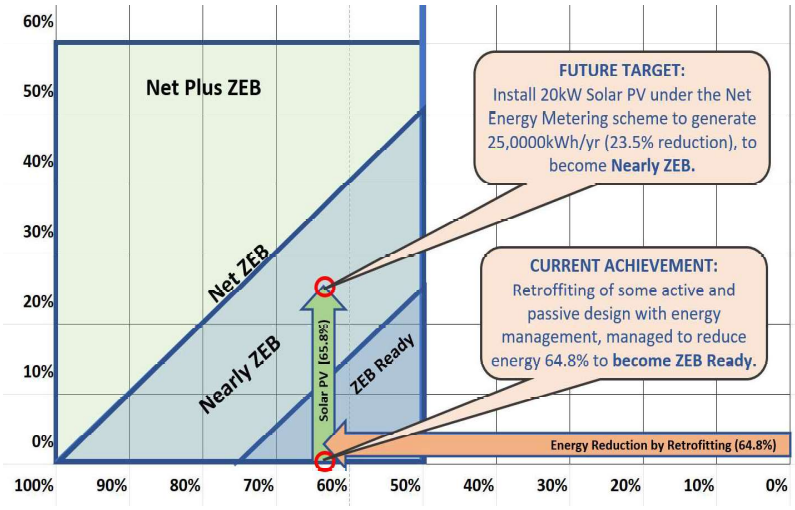

Further improvement for future target is planned by harvesting Renewable Energy implementation as follows:

Baseline [kWh/yr]	106,218
Reporting [kWh/yr]	37,366
Reduction by EE	68,852 kWh/yr
EE rate	64.8%
Potential RE	20 kWp
	25,000 kWh/yr
RE rate	23.5%
Net reduction (EE+RE)	93,852
Future Target	88.4%

ZEB Realization Plan

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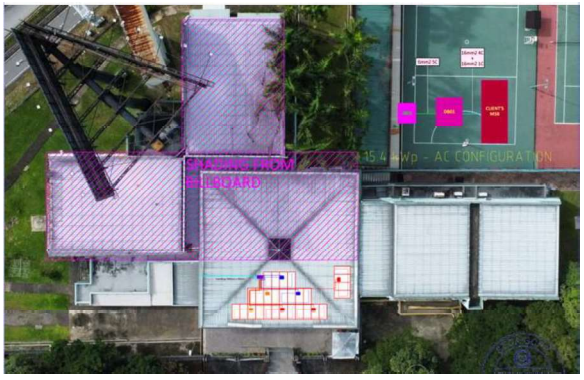

Solar Installation of **15.4 kWp** under the Net Energy Metering Scheme with total of **28 nos PV module** mono-crystalline at the roof top with savings up to **RM800+ per month** – status in progress

Thank You

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